Attorney Docket No. UD00-04 (131*206)
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	)	
	)	
Michael STRANO et al.	)	
	)	
Serial No.: 09/844,567	)	Group Art Unit: 1723
	)	
Filed: 27 April 2001	)	Examiner: Krishnan S. Menon
	)	
For: SUPPORTED MESOPOROUS CARBON ULTRAFILTRATION MEMBRANE AND PROCESS FOR MAKING THE SAME	)	

Commissioner for Patents
Washington, D.C. 20231

RESPONSE TO OFFICE ACTION

In response to the Office Action dated 26 September 2002, Applicants request reconsideration based upon the following remarks.

CLAIM REJECTIONS

The Examiner rejected claims 3, 5, 6, and 20 as being indefinite for failing to particularly point out and distinctly claim the invention pursuant to 35 U.S.C. § 112, ¶ 2.

The Examiner rejected claims 1, 3-6, 14-17, 22, 24, 26, and 32-37 as being anticipated by Rao et al., U.S. Patent No. 5,104,425 ("Rao") pursuant to 35 U.S.C. § 102(b).

The Examiner rejected claims 1, 2, 8, 16, 21, 22, 24, 28, and 29 as being anticipated by Foley et al., U.S. Patent No. 5,972,079 ("Foley") pursuant to § 102(b).

The Examiner next rejected claims 7, 18-20, 23, 25, 27, and 30 as being unpatentable over Foley in view of Lafyatis and Tung (1991), "Poly(Furfuryl Alcohol)-Derived Carbon Molecular-Sieves -- Dependence of Adsorptive Properties On Carbonization Temperature, Time, and Poly(Ethylene Glycol) Additives," *Industrial & Engineering Chemistry Research*, 30, 5, pp. 865-873 ("Lafyatis and Tung (1991)") pursuant to 35 U.S.C. § 103(a).

The Examiner next rejected claim 31 as being as being unpatentable over Foley in view of Lafyatis and Tung (1991) as applied to claim 30, further in view of Foley (1995), Carbogenic Molecular-Sieves -- Synthesis, Properties and Applications, *Microporous Materials*, 4,6, pp. 407-433 ("Foley (1995)") pursuant to § 103(a).

The Examiner last rejected claims 9-13, 28, and 29 as being unpatentable over Foley pursuant to § 103(a).

Applicants respectfully traverse these rejections for the following reasons.

INDEFINITENESS REJECTIONS

The Examiner contends that claims 3, 5, 6, and 20 are indefinite pursuant to 35 U.S.C. § 112, ¶ 2. Specifically, the Examiner contends that the term "from about" renders these claims indefinite because the term "from about *x* to *y* renders the scope of the claim(s) unascertainable." *See* Office Action of 26 September 2002 at 2 (citing MPEP § 2173.05(d)).

Applicants traverse this rejection for at least the following reasons. Initially, the section of the MPEP cited by the Examiner is inapposite to the present rejection. The appropriate section of the MPEP is § 2173.05(**b**) where it clearly states the following:

> The term "about" used to define the area of the lower end of a mold as between 25 to about 45% of the mold entrance *was held to be clear, but flexible. Ex parte Eastwood*, 163 USPQ 316 (Bd. App. 1968) Similarly, in *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), the court held that a limitation defining the stretch rate of a plastic as "exceeding about 10% per second" is definite because infringement could clearly be assessed through the use of a stopwatch.

See MPEP § 2173.05(b) at 2100-197 (Aug. 2001) (emphasis added).

Second, it is well-settled that while some claim language may not be precise, however, such language does not automatically render a claim invalid. *See Seattle Box Co., Inc. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984). When a word of degree is used, the issue becomes, "whether one of ordinary skill in the art would understand what is claimed when the claim is read in light of the specification." *See id.* In the present application, both the Specification and the claims clearly set forth that the invention is directed to supported *mesoporous* carbon membranes. Further, the rejected claims refer to both "mesoporous" and "about 1 nm to...". These terms, in combination, unquestionably provide sufficient basis for one skilled in the art to determine what Applicants have claimed as their invention.

Third, in addition to the MPEP, the Federal Circuit has routinely held that when the specification uses the qualifier "about," such usage must be given "reasonable scope." *See Modine Manufacturing Company v. United States International Trade Commission,* 75 F.3d 1545, 1554 (Fed. Cir. 1996). The term must be viewed by the decisionmaker as it would be understood by persons experienced in the field of the invention. *Id.* (citing *Andrew Corp., v. Gabriel Electronics, Inc.,* 847 F.2d 819, 821-22 (Fed. Cir.), *cert. denied*, 488 U.S. 927 (1988)). "The meaning of the word 'about' is dependent on the facts of a case, the nature of the invention, and the knowledge imparted by the totality of the earlier disclosure to those skilled in the art." *Eiselstein v. Frank*, 52 F.3d 1035, 1040, 34 USPQ.2d 1467, 1471 (Fed. Cir. 1995) ("Eiselstein need not be bound to maximum precision when the whole tenor of his disclosure indicates approximation."). Additionally, the Federal Circuit has stated that:

> Although it is rarely feasible to attach a precise limit to "about," the usage can usually be understood in light of the technology embodied in the invention. When the claims are

> applied to an accused device, it is a question of technologic fact whether the claimed device meets a reasonable meaning of "about" in the particular circumstances.

Id. One United States District Court held that the term "about" means, "approximately or nearly," and is, "a clear warning that exactitude is not in the claim, but rather it contemplates variation." *Syntex (U.S.A.) Inc. v. Paragon Optical, Inc.*, 7 USPQ.2d 1001, 1019 (D. Ariz. 1987) (holding that the use of "about" was appropriate when testing showed a plus/minus variation of five percent made no meaningful difference to the properties of the final material).

In the claims, Applicants recite that the invention is directed to *mesoporous* carbon membranes. In the specification, Applicants clearly distinguish the claimed invention from nanoporous (less than 1nm) membranes. Thus, one skilled in the art would understand the claim term "about 1nm ..." in light of the specification to mean that the membranes of the claimed invention have a larger pore size than nanoporous membranes of the prior art. Accordingly, Applicants request the withdrawal of the rejection.

ANTICIPATION REJECTIONS

In the Office Action of 26 September 2002, the Examiner made two anticipation rejections. First, the Examiner contended that claims 1, 3-6, 14-17, 22, 24, 26, and 32-37 are anticipated by Rao. To support this rejection, the Examiner assets that Rao discloses a carbon membrane comprising a support having through pores, a carbon material attached to the pores filling a portion of the pores, support pore sizes of from 0.1 to 50 μm, membrane pores sizes between 1 to 10 nm, tubular or flat disc membranes, mesocarbon material in the pores, and carbon attached to one surface of the support with carbon material partially filling the pores.

Applicants respectfully traverse this rejection for at least the following reasons. The claimed invention is directed to *mesoporous* supported carbon membranes. The specification clearly states that mesoporous materials have a pore size in the range of about 1 to 100 nm.

Further, the specification states that the claimed membranes are intended for use in ultrafiltration applications (pore size of about 1 nm to 100 nm). Rao is entirely directed to nanoporous (less than 1 nm) membranes for use in gas separation. Further, it is well-known in the art that nanoporous gas-phase separation membranes cannot be used for liquid or aqueous ultrafiltration applications as the pore size of nanoporous membranes is too small for ultrafiltration applications. The specification of the present patent application clearly discloses this distinction. *See generally* specification at 1 to 4.

Additionally, the Examiner has misrepresented the disclosure of Rao at Col. 8, ll. 10-18. Here, Rao does not disclose membrane pore sizes from 0.1 to 10 nm. Rather, Rao discloses that "at least 90% of the pores are less than 12.9Å [1.29 nm] in diameter." *See* Rao, Col. 8, ll. 16-17. This statement cannot be said to disclose a supported *mesoporous* carbon membrane having a pore size distribution in the range of from about 1 nm to about 100 nm. Anticipation requires a disclosure of the claimed invention in the same degree of detail as the claims. Rao's disclosure of membranes having 90% of the pores less than 1.29 nm fails to disclose the claimed mesoporous membranes. Therefore, Rao does anticipate the claimed invention.

Second, the Examiner purported that Foley discloses a carbon membrane supported on a porous stainless steel support with the carbon partially filling the pores. Foley was also purported to disclose operating temperatures greater than 200 °C, that the support was inherently rigid, had a porosity in the range of 01. to 100 μm, and had a pore size in the range of 30 to 100 nm.

Applicants respectfully point out that the Examiner has erred in the recitation of Foley's disclosure. Specifically, Foley does not disclose a "pore size in the range of 30-100 nm" as purported by the Examiner. *See* Office Action of 26 September 2002 at 3. Rather, Foley discloses that the "nominal diameter of the pores in the CMS material is from 3-20Å [0.3-2

nm]." *See* Foley, Col. 2, ll. 61-61. In Foley, the CMS material is deposited on the support. Thus there is no disclosure in Foley that the pore size of the *membrane* is in the mesoporous range of from about 1 nm to about 100 nm. Further, as stated above, Applicants clearly distinguished such *nanoporous* membranes from their claimed invention in the Specification.

Accordingly, for the above reasons, Applicants respectfully request the withdrawal of the anticipation rejections.

OBVIOUSNESS REJECTIONS

A. Requirements for an obviousness rejection

An invention is invalid for obviousness if "differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a); *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351 (Fed. Cir. 2001).

In order to determine obviousness, the Examiner must make the following four factual inquiries as to the following: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) secondary considerations of non-obviousness. *Ruiz v. A.B. Chance Co.,* 234 F.3d 654, 662-63 (Fed. Cir. 2000); *Graham v. John Deere Co.,* 383 U.S. 1, 17-18 (1966). Secondary considerations of non-obviousness include commercial success, long-felt but unresolved need, failure of others, copying, and unexpected results. *See id.* These factual inquiries are commonly called the "*Graham*" findings.

When making an obviousness analysis based on prior art, the Examiner must not fall prey to a "hindsight syndrome" by reasoning backward from the teaching of the patent itself. *In re*

Kotzab, 217 F.3d 1365, 1369 (Fed. Cir. 2000). According to the Federal Circuit, "the best defense against the subtle but powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references." *In re Gartside*, 203 F.3d 1305, 1319 (Fed. Cir. 2000); *see also B.F. Goodrich Co. v. Aircraft Braking Sys. Corp.*, 72 F.3d 1577, 1582 (Fed. Cir. 1996). In other words, something in the prior art, considered as a whole, must "suggest the desirability, and thus the obviousness, of making the combination" of different elements to create the invention. *See Fromson v. Advance Offset Plate, Inc.*, 755 F.2d 1549, 1556 (Fed. Cir. 1985) (citation omitted).

Accordingly, to make a determination regarding obviousness, the Examiner must make specific *Graham* findings. *See Ruiz*, 234 F.3d at 663. Further, where inventions are less technologically complex, the *Graham* findings are especially important. *Id.* (citations omitted. In such cases, "the danger increases that the very ease with which the invention can be understood may prompt one to fall victim to the insidious effect of hindsight syndrome wherein that which only the inventor taught is used against its teacher." *Id.* (internal quotations omitted).

1. Scope and Content of the Prior Art

The first *Graham* factor is directed towards the scope and content of the prior art. The Federal Circuit holds that the scope of the art, "includes art that is 'reasonably pertinent to the particular problem with which the invention was involved.'" *Ruiz*, 234 F.3d at 665 (quoting *Stratoflex Inc. v. Aeroquip Corp.*, 713 F.3d 1530, 1535 (Fed. Cir. 1983)). Prior art has been defined as "knowledge that is available, including what would be obvious from it, at a given time, to a person of ordinary skill in an art." *See Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1453 (Fed. Cir. 1984).

To prevent a hindsight-based obviousness analysis, "the relevant inquiry for determining the scope and content of the prior art is whether there is a reason, suggestion, or motivation in the prior art or elsewhere that would have led one of ordinary skill in the art to combine the references." *Ruiz*, 234 F.3d at 664-65 (citations omitted).[1] The reason, suggestion or motivation to combine may be found either explicitly or implicitly: (1) in the prior references themselves; (2) in the knowledge of those of ordinary skill in the art that certain references, or disclosures in those references, are of special interest or importance in the field; or (3) from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem. *Ruiz*, 234 F.3d at 665 (citations and quotations omitted). While the references "need not expressly teach that the disclosure contained therein should be combined with another, [citation omitted], *the showing of combinability must be clear and particular.*" *Ruiz*, 234 F.3d at 665 (citation and internal quotations omitted) (emphasis added). "Broad conclusory statements regarding the teaching of multiple references, standing alone, are not 'evidence.'" *In re Dembiczak,* 175 F.3d 994, 1000 (Fed. Cir. 1999), *abrogated on other grounds by In re Gartside,* 203 F.3d 1305; *see also Upjohn Co. v. Mova Pharmaceutical Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000).

In addition to the requirement to show motivation to combine or modify the prior art references, the Examiner must show a reasonable expectation of success for the proposed combination or modification. *In re Dow Chemical*, 837 F.2d 469, 473 (Fed. Cir. 1988). Reasonable expectation of success is assessed from the perspective of a person of ordinary skill

[1] Applicants note that the Federal Circuit has commented that while the assessment of whether motivation to combine or modify references is routinely viewed as a subset of the first *Graham* factor, an accurate assessment of whether there is motivation to combine or modify the references may require consideration of the other *Graham* factors. *See McGinley,* 262 F.3d at 1351 (citations omitted).

in the art at the time the invention was made. *Life Technologies, Inc. v. Clontech Labs., Inc.*, 224 F.3d 1320, 1326 (Fed. Cir. 2000).

The above requirements have been developed so that Examiners do not fall victim to the use of hindsight in determining whether a claimed invention is obvious over the prior art. An obviousness determination requires, "the oft-difficult but critical step of casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, *guided only by the prior art references and then-accepted wisdom in the field.*" *Dembiczak*, 175 F.3d at 999 (emphasis added)

In particular, the Examiner "cannot use hindsight reconstruction to pick and chose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988). The combination of the various teachings of unrelated references, absent evidence of a suggestion, teaching or motivation to make such a combination, "simply takes the inventor's disclosure as a blueprint for piecing together the prior art – the essence of hindsight." *Dembiczak*, 175 F.3d at 999.

2. The Differences Between the Claims and the Prior Art

Once the prior art is identified, the focus of the analysis centers on the differences between the claimed invention and the prior art. *See Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 1345 (Fed. Cir. 1984); *Ryko Mfg. Co. v. Nu- Star, Inc.*, 950 F.2d 714, 717 (Fed. Cir. 1991) ("When analyzing a patent claim for obviousness, the claim should be considered as a whole, but the [principal] differences between the [patented] claim and the prior art need to be identified."). The analysis centers on the ultimate legal question, "whether these differences are such that the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made." *TEC Systems, Inc.*, 725 F.2d at 1345.

3. The Level of Ordinary Skill in the Pertinent Art

There are six factors an Examiner should consider in determining the level of ordinary skill in the art: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) the prior art solutions; (4) the rapidity of innovation; (5) the sophistication of the technology at issue; and (6) the educational level of active workers in the field. *See Bausch & Lomb, Inc.*, 796 F.2d at 449-50.

4. Secondary Considerations of Nonobviousness

Objective indicia of nonobviousness must be considered before a conclusion on obviousness can be made. *See Hybritech,* 802 F.2d at 1380; Secondary considerations must be considered always, "not just when the decisionmaker remains in doubt after reviewing the art." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1539 (Fed. Cir. 1983). "Evidence of secondary conditions may often be the most probative and cogent evidence in the record." *Id.*

B. The Examiner's failed to establish a prima facie case of obviousness as there is no teaching or suggestion in the prior art to make the purported combination of references

Applicants traverse the Examiner's obviousness rejections for at least two reasons: (1) the Examiner failed to make the necessary detailed *Graham* findings; and (2) had proper *Graham* findings been made, it would be clear that the Examiner's failed to establish a prima facie case of obviousness because there is no teaching, suggestion, or motivation in the prior art to make the purported combination or modification of references.

The Examiner made three rejections on the grounds the claimed invention is obvious over the prior art. First, the Examiner rejected claims 7, 18-20, 23, 25, 27, and 30 as unpatentable over Foley in view of Lafyatis and Tung (1991). The Examiner recognized that neither of the references discloses the claimed invention. However, the Examiner purported that it would have been obvious for one of ordinary skill in the art at the time of the invention to use the teaching of

Lafyatis and Tung (1991) with the teachings of Foley. The Examiner reasoned that one skilled in the art would consider the membrane material an "alternate but equivalent to the membrane taught by Foley (079) *for equivalent function.*" *See* Office Action of 26 September 2002 at 5 (emphasis added).

This rejection is fundamentally flawed because Foley is directed to membranes suitable for *small molecule separations*, i.e., nanoporous membranes. *see* Foley at Col. 4, ll. 13-20. Lafyatis and Tung (1991) discloses carbon membranes having *microporous* and *mesoporous* structure. There simply is no motivation -- apart from Applicants' own invention -- to combine the teachings of the two references. The statement that one skilled in the art would consider a *microporous /mesoporous* membrane "equivalent" for the CMS materials disclosed in Foley is without support. One skilled in the art would understand that a mesoporous/microporous membrane simply will not function for small molecule, such as gas-phase, separations as the pore size is too large. The material to be separated would simply pass through the membrane.

The Examiner has the initial burden to show, apart from the Applicants' own invention, the teaching, suggestion, or motivation to make the purported combination. The Examiner has failed to meet this burden. Rather, Applicants have shown that the two references cannot be logically combined as there is nothing in teachings of Foley (nanoporous membranes) to motivate one skilled in the art to consult the teachings of Lafyatis and Tung (1991) (micro-/mesoporous membranes). Further, there is no motivation in Foley to incorporate the meso-/micropores of Lafyatis and Tung (1991) into the CMS material of Foley as the larger pores would render the membranes ineffective for all the applications disclosed in Foley. Accordingly, there is no motivation to combine the references and the rejection should be withdrawn.

Second, the Examiner rejected claim 31 as unpatentable over Foley in view of Lafyatis and Tung (1991), as applied above, further in view of Foley (1995). The Examiner acknowledged that a purported combination of Foley and Lafyatis and Tung (1991) would not teach the claimed invention. However, the Examiner alleged that Foley (1995) discloses varying the pore size by varying the amount of PEG, therefore, it would have been obvious for one of ordinary skill in the art at the time of the invention to use combine the various teachings "to have varied pore size in the membrane as alternate but equivalent for equivalent function." *See id.*

For the same reasons stated above, Applicants submit that there simply is no teaching, suggestion, or motivation to make the purported combination. The Examiner's statement regarding "equivalent function" is without merit. Foley is directed to nanoporous membranes. Foley teaches varying pore size with pyrolysis temperature. *See* Foley at Col. 10, ll. 5-8. In contrast, Foley (1995) is directed to mesoporous membrane and manipulating pore size with varying amounts of PEG. One skilled in the art would find no value in creating meso- or micropores in a nanoporous membrane as it would destroy the function of the membrane to separate small molecules.

Third, the Examiner rejected claims 9-13, 28, and 29 as being unpatentable over Foley. The Examiner acknowledged that Foley does not disclose a membrane having a water permeance or a BSA rejection. *See* Office Action of 26 September 2002 at 6. This rejection is simply without merit as Foley is entirely directed to nanoporous membranes. It is impossible to measure water permeance, let alone BSA rejection, with the nanoporous membranes of Foley as neither material could pass through such a membrane. Accordingly, there is no reasonable basis to modify the reference as suggested by the Examiner.

The Examiner has failed to meet the initial burden of providing an independent basis to combine or modify the various cited references.

Accordingly, for at least the above reasons, Applicants respectfully request the withdrawal of the rejection of claims 1-37. Applicants submit a two-month request for extension of time for response with this paper and a check for the associated fee. If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 03-2775. If an extension of time under 37 C.F.R. § 1.136 not accounted for above is necessary for consideration of this paper, such an extension is requested and the fee should also be charged to our Deposit Account.

The prior art made of record and not relied upon does not disclose or suggest the invention of the present claims.

Respectfully submitted,

Dated: 26 February 2003

By: _____
Daniel C. Mulveny
Reg. No. 45,897

246457_1.DOC